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Visual presentation of mental images in urban design education: cognitive maps

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Abstract

Being basic concern of urban design education, urban space, can be defined as a livable and perceivable multi-dimensional place that is also has time content. It is formed by buildings, perceived by city-dwellers and has many inter-related urban activities in it. After researches, it can be seen that there has been many approaches that form a basis for urban design education. Among these approaches, this study focuses on cognitive and psychological approaches of urban space which have a great importance in urban design. From this point of view, because of affecting human behavior and activities and considerably important for giving clues to urban designers, the concepts of perceiving space, image ability, spatial legibility and cognitive maps that concretize these mental images or in other words turned these images into drawings were defined in the study. Subject of the study was evaluated within objective and subjective viewpoints. This study chose Selcuk University Campus as a sample area in which we work as an educator and which is the living space of many students. The aim of the study is to find out the undergraduate students' perceptions and images related to Campus Area in which the students gain experiences every day and in accordance with the results to obtain design clues for Selcuk University Campus Area. For attaining this goal, we searched how the spatial image changes by students' individual perception? Which spaces in the area are more easily-remembered than the others? Which are preferable and admirable spaces or not for students? Sampling ratio of the study is approximately %15 (*30 undergraduate students*) within the students who took an urban design education and live in the campus area. Producing cognitive maps of these students and interpreting them by using Kevin Lynch's (1960) '*cognitive urban image*' and Jack L. Nasar's (1997) '*evaluative urban image*' elements are the methods of the study. In conclusion; after obtaining and analyzing the cognitive maps, we got some important design clues to produce successful urban spacesfor Selcuk University Campus Area.

*Keywords:*cognition, cognitive maps, image, perception, urban space image, urban design

1. Introduction

Urban space which is the basic concern of urban design education can be defined as a livable and perceivable multi-dimensional place that is also has time content. It is formed by buildings, perceived by city-dwellers and has many inter-related urban activities in it (Bilsel et.al., 1999). "*Urban space*" turns into '*urban place'* when urban space bear a sense to its users and/or user belongings to space increase.Thus, beyond physical formations, '*place*' is a '*sensed value'* as a social unity which has various meanings in it, shaped with peoples' space and time experiences (Ersoy, 2002).

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Therefore, in urban design education, '*space-place'* relationship, transforming '*space'* to authentic '*place'*, developing meaningful '*places'* anddesigning *'space'* with the sense of*'place'* are considerably important on space usage and producing successful urban spaces(Schultz, 1984; Trancik, 1986; Lefebvre, 1996; Soja, 1996; Boyer, 1996; Montgomery, 1998; Bilsel et. al., 1999; Bilsel et. al., 2000).

There are many researches related to '*urban space design*', the art of constituting '*place*', in literature. These researches which discuss different dimensions of the subject show that '*urban space design'* is a multi-dimensional design area. As a result of explicating'*urban space design'* literature, we can say that there are four different upper approaches especially important on the point of '*transformation of space toplace'*(Irklı et. al., 1996; Bilsel et.al., 1999; Carmona et. al., 2003; Topçu, 2011).These approaches can be listed like below;

1. *Sociological approaches related to 'space-place' relationship that bring historical and cultural values in the foreground*
2. *Human needs approach related to space*
3. *Perception-based cognitive, psychological and visual-aesthetic approaches that orient design*
4. *Design approaches based on urban activities and urban forms* (Topçu, 2011).

This study focuses on *perception-based cognitive, psychological and visual-aesthetic approaches that orient design* among above design approaches. From this point, the conceptual framework of the study was explicated on the basis of subjective (*perception, image, cognition and cognitive maps*) and objective aspects (*perceivability, imageability and legibility of space*) of the subject.

People are in a mutual interaction with environment not only with physical properties but also psychological properties too. Space is central to the experience of urban design and has a perceptual presence of its own (Isaacs, 2000). In the '*space to place'* transformation process, perceiving any space by users, reading it as a text, then having some images in the brain related to this space, loading meanings to it, evaluating the space and finally act with these evaluations (*cognitive behaviors*) is considerably important (Rapoport, 1977). These concepts explain the important stages of urban space image and this process is a subjective process by reason of being customized.

An urban design process requires collecting all possible information from the urban space and exploiting it adequately. All design should rest on research basis that include both qualitative and quantitative information. There is no doubt that *an important first step of urban design is to define the image of the environment* (Luque-Martı´nez et al., 2007).

For understanding and defining urban space image, visual, cognitive and perception-based study is commonly necessary on the first stage and this is generally come up with cognitive mapping. The aim of the studies in which visual environment is evaluated are to display human-environment interaction and to provide these interaction data for improving living environment in terms of social and physical easiness and create modern and livable urban spaces. In this point, cognitive maps –*subject of our study*-which can facilitate for improving the urban space come into being. These maps which turn cognitive images into drawings are key elements in the diagnosis, which should serve as the basis of urban design. These mental images are knowledge structures that guide also the users' behaviors and activities in the urban space. They can be used in decision-making processes by providing a mental-cue for walking around the space (Kotler & Gertner 2002;Nadeau et. al.2008). In this point, it is necessary that the objective values which the urban space presents should have a strong and successful urban identity and quality to make positive subjective evaluations. Values that presented in a coherent and apparent way can be successfully perceived. In other words, the process of subjective perception in a sense depends on objective values that the urban space offers. From this point of view, because of affecting human behavior and activities and considerably important for giving clues to urban designers, the concepts of *perceiving space, imageability, spatial legibility and cognitive maps* were defined within the scope of the study.

Selcuk University Campus Area in Konya (Turkey) which is the living space of many students was chosen as a sample area. The aim of the study is to find out the undergraduate students' perceptions and images related to Campus Area in which the students gain experiences every day and in accordance with the results to obtain design clues for Selcuk University Campus Area. For attaining this goal, we searched *how the spatial image changes by students' individual perception*? *Which spaces in the area are more easily-remembered than the others*? *Which are preferable and admirable spaces or not for students*?

A '*cognitive map*' drawing exercise with undergraduate students related to Selcuk University Campus Area and analyzing these maps by Lynch's (1960) '*cognitive urban image*' and Nasar's (1997) '*evaluative urban image*' analysis are the methods of the study. For being the *city image is a mixture of cognitive and affective elements***,** these two methods were used. Sampling ratio of the study is approximately %15 (*30 undergraduate students*) within the students who took an urban design education and live in the selected campus area. In this study, we overlaid the students' cognitive maps to produce a composite, which depicts the image and the evaluative image of the sample campus area.

In conclusion, from the derived data our study made some effective suggestions for Selcuk University Campus Area in private. This will be the starting point for drawing up the Campus Urban Design Project because the study of the urban space image is an important part of the diagnostic for the urban design process. Similarly, a user-oriented approach maintains that identifying the needs and wishes of the users (*in our study-undergraduate students*) is essential, as is being more effective in generating value for them (Luque-Martı´-nez et al., 2002). Conceptual framework of this study can be seen below (Figure 1).

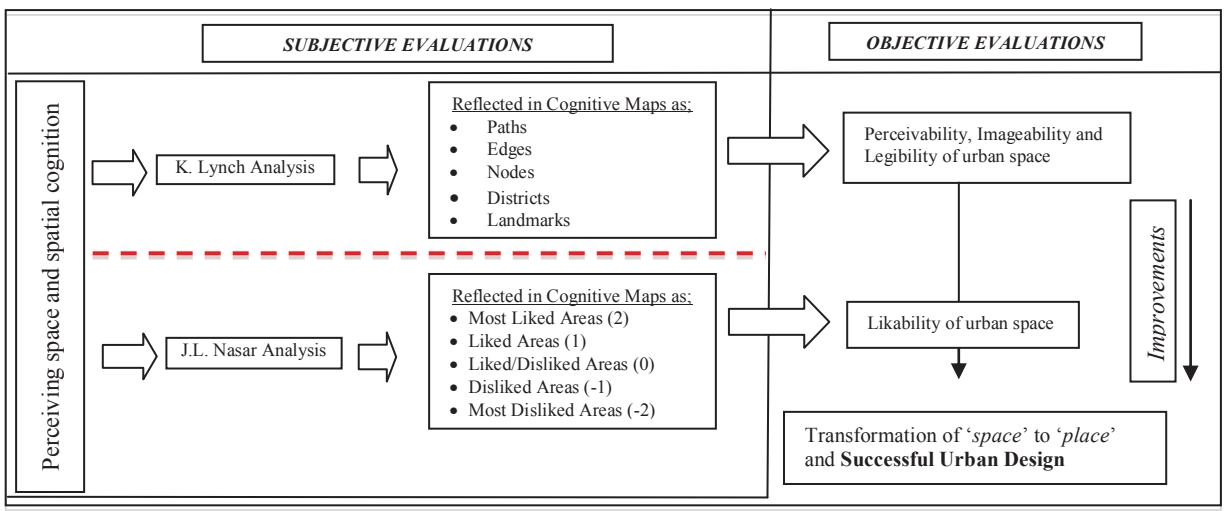


Figure 1. Conceptual framework of the study

2. Subjective and Objective Evaluations of Urban Space

2.1. Perceiving Space and the Emergence of Mental Images (Subjective Evaluations)

Because of relating to feeling and understanding the premonitory effects of outer space by sensorial organs after the interaction between human and space; perception, image and cognition are mental phenomenon. They explain the viewer-commentator process and involve collecting data from the outer space, organizing and commenting them in the brain (Aydınlı, 1986; Bilsel, 2002; Carmona et.al., 2003).

The human capacity of perception is not wide to evaluate every signal from the environment. Thus, people take into accounts which have priority and private for her/him. People who take an environmental image add his/her interpretations, requests and thoughts anyhow to it while reflecting. In other words; the environmental image that comes from any people, embodies individual image as much as defining that environment (Lynch, 1960).These evaluations can be change one person to another or one society to another. Demographic properties such as social structure, age, gender etc. and physical properties of environment are important for perceiving space in a different way. The realization and learning of the environment are completely depending on the users' field of interests and perception forms. For example; some person realize structures firstly in a square and some are only the eating-drinking facilities (Lynch 1960; Banerjee & Southworth 1990).

After the perception process, perceived elements are stored in the brain in the form of images. Image is the first presence of environmental identity in human brain with both past and existent experiences.

Lynch (1960) explained that environmental images are the result of a two-way process between the observer and his environment. The environment suggests distinction and relation, and the observer -*with great adaptability and in the light of his own purposes*- selects, organizes, and endows with meaning what he sees. The image itself is being tested against the filtered perceptual input in a constant interacting process. Thus, the image of a given reality may vary significantly between different observers (Buttimer & Seamon, 1980) and can be thought as mental representations of living environment or cities with its design, order, appearance and architectural properties for people (Bilsel, 2002). The components of cities (*streets, avenues, squares etc*.) cannot be denied for being important at constituting urban image and for gaining clues about that city life.

As regards measuring the image of a certain place, *in our case a university campus area*, summarizes what we know about that place and of the feelings it evokes. In other words, *image of a certain place is a mixture of cognitive and affective elements.* The cognitive elements include attributes by which an individual knows or identifies the urban space's characteristics. The affective elements represent an individual's attitudes to and feelings for the urban space, developed through past experiences related to the place, its inhabitants and the objects and organizations connected to it (Luque-Martinez et. al., 2007).

Being in a constant relationship of images with perceived object, in other words; if perceived object, element or environmental information is perceived constantly, repetitively, the mental images turn into cognition. The situation of being understood, taught and grouped of environmental image constitutes environmental cognition. In other words, perceiving any space is stored on the brain in the form of images. If this process has continuity, these stored data will turn into cognition.

Amos Rapoport (1977) presents three phases for reading and analyzing the environment: environmental perception, environmental cognition and environmental evaluation. The individual moves around the city, makes and elaborates a spatial scheme and constructs cognitive schemes and mental maps (Rapoport, 1977; Nojima, 2000). The individual evaluates and chooses environmental preferences.Though presented as a linear process, the model is full of constant and continuous feedback loops (Isaacs, 2000).Mental evaluation process from perception to action can be seen below (Figure 2).

Within this framework of human interaction with an environment, the pure aesthetic experience occurs at the level of perception. There is, then, reason to believe that a more aesthetically appealing pedestrian environment will attract more walkers than one that is less appealing (Isaacs, 2000).

After the mental image and cognition process, we can take the first step of the urban design called cognitive maps which turn these mental images into drawings.

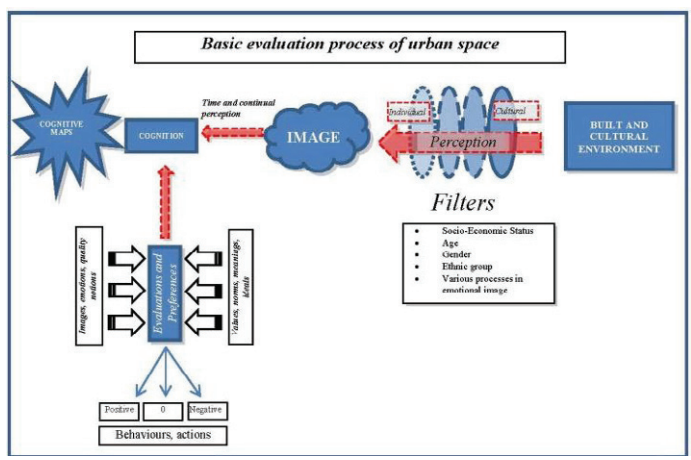


Figure 2. The formation of cognitive images (diagram was shaped with the aid of Gollege & Simpson, 1987 and Rapoport, 1977).

2.1.1. Visual Presentation Technique of Mental Images: Cognitive Maps

Withinenvironmental psychology and urban design there is now a long tradition of work on cognitive mapping, often known more popularly as the study of 'mental maps'. Such work has attempted to gauge peoples' perceptions and mental images of various types of environment (Kitchin, 1994; Lynch, 1960; Pocock &Hudson, 1978; Pinch et.al, 2010). Eden (1992) points out; it is essentially a form of visual aid to enhance our understanding of the thoughts of an individual, group or organization. These maps are the mental responses of lived and perceived environment/urban spaces. It is a series of psychological process that provide human to store and code data related to relative concepts and the quality of phenomenon of human living environment. Human can orient himself/herself through mental maps and can have an approximate idea about the city.Cognitive mapping refers to the ability to collect, organize, store, recall, and manipulate information about the environment (Downs & Stea 1977; Young, 1999; Altman & Chermes 1990).

There are many interpretations and different ways of using concepts of mental cognition and mental maps in academic research. The connection between cognitive mapping and urban design is not new (Golledge & Stimson, 1997) and has shown remarkable persistence. Starting with Lynch's (1960) seminal work in the late 1950s, environmental cognition and cognitive maps research has been embraced by a wide range of disciplines (Devlin, 2001; Golledge, 1999; Golledge & Stimson, 1997).

Providing user participation in the process of urban space design is an important factor to increase urban space quality and spatial performance. User-focused design process can provide to attain desired target rapidly and effectively. If designer's language is line and drawing, it is necessary to constitute common language between designer and user.In this point, cognitive maps -*the concrete products of perception and image process*- are one of the most important data for urban designers (Aksoy, 1987). Therefore, cognitive maps are important components in understanding and creating successful and livable urban spaces (Devlin, 2001; Zimring & Conroy Dalton, 2003). In addition to being these maps an important data source for urban designers, they also provide the users to gain the sense of direction and way-finding abilities.

Among a number of publications on this subject, we would like to draw particular attention to the studies written by Kevin Lynch, *The Image of the City (1960)* and *Evaluative Image of the City* (1997) by Jack Nasar.

2.1.1.1. Lynch Analysis

Perhaps the first to connect cognitive processes, mental maps and better design was Lynch (1960) who advocated the understanding of images of the world in which people perceive their lives and the world in which they would like to live in order to improve design (Fenster, 2009). Kevin Lynch's '*The Image of the City*' was a pioneering empirical work on this subject. In this study, Lynch investigates the quality of the visual environment, introducing new research procedures and new concepts such as way finding and mental maps. He examines the legibility of the city structure from the point of view of user, dwellers and their use of mental maps, pointing out the relevance of urban landmarks, and the dweller's mental image of the city (Gouveia, et. al. 2009).

Lynch (1960), in his work, investigated three American cities (*Boston, Jersey City, and Los Angeles*) after 1950's using surveys (*direct interviews*) and illustrations (*asking respondents to draw sketches of city plans or their fragments*) to find out the image of these cities. By separating essential and noteworthy elements, he tried to grasp the image of a city as it emerged in the awareness of its inhabitants (Saarinen 1976; Walmsley et.al. 1990; Young, 1999). In other words, the main aim of his study is to determine the physical elements of the environment that stick in someone's mind. Based on sketch maps and interviews with residents in these American cities, he categorizes inhabitants' image of the city into five physical elements (Long & Baran, 2006). These elements play a key role in creating legible places and affects people's perceptions of their environment (Lynch, 1960) (Figure 3). These are; paths (*such as streets, walkways, canals or railways*),edges(*such as shores, edges of development or walls that are the boundaries of areas*),districts, nodes (*such as junctions, squares or street corners*), landmarks (*such as buildings, signs, mountains, etc…*) (Lynch, 1960; Zmudzinska-Nowak, 2003; Fenster, 2009). For Lynch (1960), cities with these five elements are clearly legible; offer more visual pleasure, emotional security and a heightened potential depth and intensity of human experience.These urban elements heighten imageability, legibility and clarity of urban space (Aragones & Arredondo 1985; Nasar, 1990).

Figure 3.Lynch's image elements (Source: Making Better Places-Urban Design Qualities Handbook)

Using this analytical background, the designer could proceed to develop a visual plan at the city scale, whose object would be to strengthen the environmental image (Lynch, 1960).

2.1.1.2. Nasar Analysis

For designing city appearance, however, imageability is not enough. Humans have feelings, both negative and positive, about their surroundings and the imageable elements. In fact, evaluation is central to our perception and reaction to the environment. In addition, evaluation and imageability interact; people will recall places about which they have strong feelings, and they will more likely have feelings about the imageable parts of the city. In other words, evaluative reactions heighten imageability, and imageability intensifies evaluations. In this framework, Nasar's study titled '*The Evaluative Image of the City'* follows the work of Lynch and further explores the role of human evaluations of the cityscape.

Nasar's (1997) work describes how to assess, plan and design the appearance of cities to please inhabitants. He focuses on the ***likability of the cityscape*** (Nasar, 1997). The concept of his evaluative maps extends Lynch's work (1960) on cognitive maps. Nasar (1997), in his work, identifies the likability levels as; *most liked, liked, liked/disliked, disliked and most disliked areas*.

2.2. The Importance of Perceivability, Imageability and Legibility of Urban Space (Objective Evaluations)

In addition to subjective evaluations, it is necessary that the objective values of the urban space should be successfully offered. In other words; subjective evaluations related to urban space depends on successfully offered objective values. Additionally, the success of urban space depends on satisfaction of psychological aspects as much as physical aspects.

One of most important needs of people who live in cities today is to live safely and to sustain his/her life without waste of time. This can come up with easy-perceptible, legible and clear urban design. The urban environment, to some degree, can facilitate/limit one's orientation, depending on the structure and characteristics of the physical elements of the city. In this regard, Lynch's concept of perceivability, imageability and legibility of space has been fundamental and rather important concepts in the urban design, planning and architectural fields for a few decades and for giving clues to urban designers (Long & Baran, 2006). These concepts helps us to orient and find our way around, thus enhancing our enjoyment of a city (Lynch, 1960; Tibbalds, 1992; Nasar, 1997) and also help the city to have a strong image.

Legibility and imageability mean the visual quality of the urban environment: the apparent clarity or legibility of the cityscape, the ease of recognition, realization and organization of parts of an urban space and can be defined as the environmental properties that provide the person to discover her/his environment without being lost (Lynch, 1960; Wener & Kaminoff, 1983; Yeung & Savage, 1996; Nasar, 1997). A legible space gives emotional trust, increases potential density in experience and decreases chaos, anger and unconscious crowd in space (Lynch, 1960). In this point, Gombrich (1984) explains that order is easy to perceive and remember, but can become boring, even perceived automatically. However, disruption and variation excite the mind. Therefore, aesthetics is a balance of order and confusion (Isaacs, 2000). Unknown environments can tempt us too. But, if the barest installations do not be regulated to be meaningful, they can stay as an information chaos (Pollet & Haskell, 1979). The possibility of creating meanings for a city can be achieved by '*reading*' it. This can generate strategicpower, spark joint efforts, inspire and shape initiatives and provide resources for the processes of identity formation (Healey, 2002).

3. Findings of the Research

3.1. Description of the Sample Area

Selcuk University Campus Area which was chosen as a sample area is at the north side of the city (Konya) and 20 km. distance from the urban center. It has social facilities, dormitories and recreational areas that students can benefit from in addition to various educational buildings. The location of this area in the city (Konya) and its general spatial order can be seen below (Figure 4).

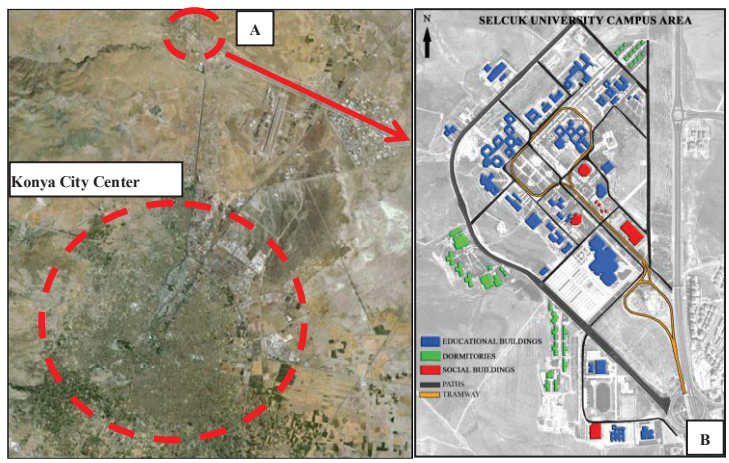


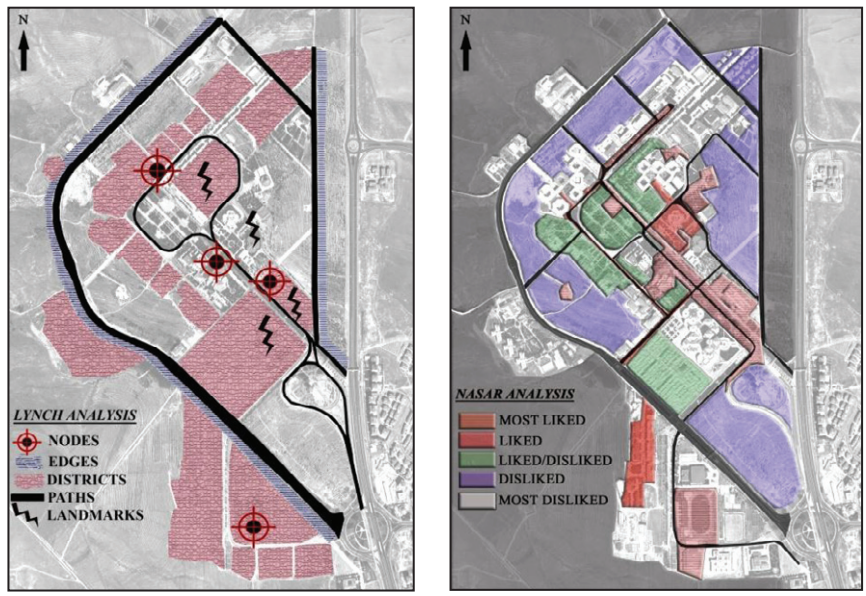
Figure 4. The location of the sample area in Konya city (A)General spatial order of Selcuk University Campus Area (B)

3.2. Subjective and Objective Evaluations of Selcuk University Campus Area

The aim of the study was to find out the undergraduate students' (30 students) perceptions and images related to the area in which they gain experiences every day. Thus, we got the students to draw the image of the area according to Lynch analysis. After obtaining students' cognitive maps, we overlaid them to produce a composite (Figure 5-A). When we compare Lynch analysis of the area with the real general spatial order, we can infer some important points related to the sample area below;

- Students perceive each faculty buildings and its environment as districts,
- The main outer artery of the area that comes from the city center detaches the dormitory buildings from faculties and has a wide width. This main artery and the tramway route perceived by the students as the important paths.
- The main outer artery, in addition to being important path, perceived by the students as a clear edgeas this route is used by the students intensively.
- Accordingly, the tramway stops characterized as nodes by the students.
- The social buildings such as Gökkuşağı Shopping Center, S. D. Culturel Center, University library and sport facilities of the University perceived as nodes by the students.
- For being the only shopping center in Campus Area, Gökkuşağı Shopping Center perceived as a landmark in addition to being node.
- Faculty of Medicine and its environment (parking area), for being the largest block in the area, perceived as a landmark and node.
- The only Mosque of the area seen as a landmark by the students.
- Faculty of Eng.&Architecture perceived as a landmark unavoidablebecause the students sustain their education in this faculty.

- The districts between faculties and the main artery are not perceived by the students.
- The entrance of the Campus area is not perceived anyhow because of having undefined and vehicle-oriented spaces.
- The Mosque and its environment are not perceived anyhow. This district denotes only a praying space on Fridays. Thus this district is a landmark. But, except Fridays, this district expresses nothing.
- Dormitory buildings and the faculties separated with the effect of main artery.



(A) Lynch Analysis (Image of the area) (B) Nasar Analysis (Evaluative image of the area)

Figure 5. Image and evaluative image of Selcuk University Campus Area by undergraduate students (A and B)

After Lynch analysis we found out the affectional subjective representation of the area. In this point, Nasar Analysis was made by the selected students. The below composite shows the places the students like and the places that they dislike, as well as the degree of consensus on these evaluations (*from liked by most students to disliked by most students*) (Figure 5-B), and it points to psychical properties that may underlie the evaluations. According to Nasar analysis, we can infer some important points related to the sample area below;

- Students like the route from the entrance of the area to the Faculty of Eng&Arcitecture because of having integrated with green route, having some social spaces and landmarks along it. Thus students walk with pleasure in this area.
- They dislike the areas that they cannot perceive as shown in the Lynch analysis (Figure 5-A).
- They cannot decide whether like or dislike the areas between the faculties. Especially the space in front of the Faculty of Eng&Arcitecture, the park in front of the Faculty of Science, Faculty of Dentistry and its environment and parking lot of Faculty of Medicine.
- Faculty of Medicine and its environs are not liked by the students because of its height and its wide width.
- In the campus area, there are a lot of undefined and vacant areas. Thus these areas are not liked by the students.
- The most liked districts of the University by the students are; *the sport facilities district* that has its vocational high school, *the student festivalplace* and the district that has some social buildings such as; shopping center, library, university cafeteria etc (*the route from the entrance of the campus area to Faculty of Eng&Arcitecture*) .

4. Conclusion

By defining the image of the environment and discovering the users' satisfaction level related to the urban space, urban designers can produce successful urban '*places*' that have meanings and belongings. Thus, this study presented a kind of recipe to University management, related persons or institutions and designers for Selcuk University Campus Area to create '*places'* not '*spaces'*. True campus design can be achieved by analyzing the psychology of the space as it deals directly with sensed environment of the urban space. In this sense, it would be logical to assume that when a campus area has a good image, its users will feel more satisfied and proud of being part of it and this, in turn, can boost its image. The users preserve and actively use the urban space in which they integrate, feel belongings and find a part from her/him. With such information, designers can target specific problems in specific places to improve space appearance. In our study, to improve campus appearance and the students' quality of campus life, some findings should be taken into account.

It is obvious that, in Selcuk University Campus Area, there are a lot of undefined and vacant spaces between faculties. Because of this reason they are not perceived by the students and are not satisfactory for them. They are meaningless spaces for them. The main artery of the area decreases the sustainability of space transitions because of its width. Social spaces of the campus area are the most perceived spaces, have meanings and satisfactory for the students. But, unfortunately there are few opportunities for them. To make Selcuk University Campus Area be more perceivable, imageable, legible and successful '*place*', University management, related persons or institutions and designers should notice these above findings. So, this study can be the starting point for drawing up the urban design project of the Selcuk University Campus Area.

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